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EXAMINER

SAYADIAN, HRAYR

ART UNIT

PAPER NUMBER

2815

NOTIFICATION DATE

DELIVERY MODE

03/19/2009

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com



## **DETAILED OFFICE ACTION**

### **35 U.S.C. § 102 Rejections of the Claims**

1. The text of the appropriate paragraph(s) of 35 U.S.C. § 102, providing the legal basis for the anticipation rejection(s) in this Office Action, can be found in a previous Office Action.
2. Claims 1-5 are rejected under 35 U.S.C. § 102(b) as being clearly anticipated by U.S. Pat. Nos. 5,647,917 and 5,434,100 to "Oida" and "Nakamura," respectively.

As to interpretation of scope of the claims: The claims are directed to manufacture, but still define it by how it reacts to characterizing incident radiation. Specifically, claim 1 is directed to a substrate that has a haze of not more than 2 ppm over an effective area including the surface area of the substrate. Claim 1 specifically defines haze as the ratio of intensity of scattered light to intensity of incident light. Using generic scattered intensity as part of the claim's definition results in the scope of "scattered" having has a scope reading on scattered intensity due to surface roughness, surface dislocations, or both.

The Application explicitly admits that the claimed substrate is made by "usual" methods of production and polishing. See, for example, paragraph [0036]. These substrate making methods then resulted in substrates having dislocation density of equal to or less than 1000 per cm-squared. The application then states that it is desired to have less than or equal to 500 dislocations per cm-squared.

As to rejection of claims over the prior art: The disclosure of Oida and Nakamura meets of the limitations of the claims. See, the front pages and FIGs. 1, disclosing dislocation density in InP of less than 10 per square centimeter (Nakamura indicates InP in the body of the reference and <100 dislocations per square centimeter).

Oida specifically discloses an epitaxial substrate having less that 10 dislocations per cm<sup>2</sup> that is also mirror polished (see, for example, column 5, lines 43-44) and therefore would have no surface roughness, and therefore there would not be any haze due to reflection from roughness.

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Additionally, Examiner notes that the probability of a dislocation existing in an effectively used area of 1 square micron (when the average dislocation density is less than 10 in square centimeters) is about 1 in 10,000,000. The haze due to dislocations from an effectively used area of 1 square micron of the substrates Oida discloses will therefore not be more than 2 ppm because there will be no dislocation to reflect incident light.

Similarly, Nakamura in its front page discloses less than 100 dislocations per squared centimeters for an epitaxial InP substrate with an off-angle 0.05-0.1 from the 100 direction. See, for example, column 4, lines 49-53. Nakamura discloses the substrate to be mirror finished and therefore would have no roughness. See, for example, column 4, lines 11-25.

Since both Oida and Nakamura disclose epitaxial InP substrate having mirror finishes and having less than 100 dislocations per squared centimeters (which is less than 500 dislocations per squared centimeters, the least dislocation density claimed by this application), which are the structural features disclosed for the claimed substrate, the epitaxial InP substrates of Oida and Nakamura would have less than 2 ppm haze (which is the effect of the disclosed structural features) as for the claimed substrate.

### **35 U.S.C. § 103 Rejections of the Claims**

3. The following is a quotation of 35 U.S.C. § 103(a), the basis for the obviousness rejections in this Office Action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section § 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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4. Claims 1-5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Oida and Nakamura in view of PGPUB US 2004/0214407 to "Westhoff," U.S. Pat. No. 4,846,927 to "Takahashi," U.S. Pat. No. 7,304,310 to "Shortt." Born and Wolf, "principles of Optics," pp 774-779, seventh edition (1999), is provided as evidence.

For the sake of argument only, and in the interest of compact prosecution, if the produce of manufacture is deemed to be structurally limited by the method of manufacturing and testing, then examiner notes that obtaining an epitaxial InP substrate having a haze of less than 2 ppm would have been obvious.

Specifically, Oida and Nakamura disclose an epitaxial InP substrate having a mirror finish and having less than 500 dislocations per squared centimeters. Oida and Nakamura do not explicitly disclose using a wavelength of 488 nms to measure or to determine the haze of the surface of the substrates.

Using model 6220 by KLA-Tencore (which produces the wavelength of 488 nms used by the inventors of this application to measure/determine) the surface roughness of InP substrates that are the subject of this application) however is conventional and well known in the art. See, for example, Westhoff, paragraph [0072] describing using model 6220 to measure/determine haze and preferring substrate having haze values less than 0.05 ppm (which is less than the claimed haze of 2 ppm).

It would therefore have been obvious for one of ordinary skill in the art to use model 6220 KLA-Tencore device (including its 488 nm wavelength light source) to obtain InP epitaxial substrates having haze less than 2 ppm, at least for its art recognized suitability for intended purposes.

Indeed Shortt, assigned to KLA-Tencore, is evidence that the wavelength of 488 nms is used to determine haze having values less than 2 ppm. See, for example, column 7, lines 4-6; see also Table 2 on column 21. The haze for the wavelength of 488 nms, which is longer than the ultra-violet wavelength used to generate the haze data in Table 2 would be less. See, Born and Wolff, the last paragraph on page 779, disclosing that

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scattering (haze) intensity is inversely proportional with the fourth power of the scattered wavelength.

Additionally, again in the interest of compact prosecution, Examiner notes that the LEC is well-recognized high productivity method to produce substantially dislocation free InP. See, for example, Takahashi, the abstract; column 3, lines 47-60; and examples 1 and 2, described in columns 3 and 4.

### **Response to Applicant's Argument(s)**

5. The arguments in the 1/7/2009 "Reply" to the 10/7/2008 non-final Office Action have been fully considered. These arguments however are not found persuasive.

Explicitly recognizing that the prior art discloses dislocation density in the narrowest claimed range, the Reply contends that the haze is different than scattering due to dislocation and therefore contends the prior art fails to disclose the scattering due to roughness being less than 2 ppm.

In response, it is noted that the claims define haze as being the ratio of scattered light to incident light. This definition specifically generally defines haze not to be limited as scattering due to surface roughness as opposed to surface dislocations. Haze as defined by the claims has a scope reading on scattering by surface roughness, or by surface dislocation, or by both. The specific definition of haze in/by the claims therefore makes the recited haze in the claims have a scope not limited by what the art might have understood to mean.

It is also noted that the at prior art explicitly anticipates the structural features of the claimed substrate and additionally renders obvious the value of haze of less than 2 ppm in an InP substrate, whether haze is deemed to have a scope limited by that understood in the prior art or limited by the broader definition used in the claims.

### **CONCLUSION**

6. **THIS OFFICE ACTION IS MADE FINAL.**

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A shortened statutory period for reply to this Office Action is set to expire **THREE MONTHS** from the mailing date of this Office Action. Applicant is reminded of the extension of time policy as set forth in 37 CFR § 1.136(a).

If a first reply is filed within TWO MONTHS of the mailing date of this Office Action and the advisory Office Action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory Office Action is mailed, and any extension fee pursuant to 37 CFR § 1.136(a) will be calculated from the mailing date of the advisory Office Action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this Office Action.

Any inquiry concerning this communication or earlier communications from an Examiner should be directed to Examiner Hrayr A. Sayadian, at (571) 272-7779, on Monday through Friday, 7:30 am – 4:00 pm ET.

If attempts to reach Mr. Sayadian by telephone are unsuccessful, his supervisor, Supervisory Primary Examiner Kenneth Parker, can be reached at (571) 272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available only through Private PAIR. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. The Electronic Business Center (EBC) at 866-217-9197 (toll-free) may answer questions on how to access the Private PAIR system.

/HAS/

/Kenneth A Parker/

Supervisory Patent Examiner, Art Unit 2815